

Proposition de stage M2

MAGNETORESISTIVE STRUCTURES WITH STRAIN SENSITIVE ELEMENTS

Abstract

Spintronic development of giant and tunnel magnetoresistive (GMR and TMR) structures is a story of great success for magnetic recording with resistive readout [1]. However, passing large currents through the microstrips for magnetization switching becomes increasingly challenging, as the dimensions are reduced below a micrometer. The alternative electric methods can employ magnetoelectric effects directly [2,3] or via strain.[4] Strain controlled magnetic structures are recently attracting growing attention of the scientific community [5]. It is mainly motivated by the use of strain to control the magnetization direction in magnetic materials that is a key issue for magnetic information recording. We propose to control the magnetic anisotropy and electric resistance in magnetic layers through elastic effects applied via substrates. Such functionalities can result in technologically important memristive-like multistate operation in bulk [6] and surface configurations [7] and present an alternative approach for magnetoresistive memories.

The successful candidate will be mainly involved in preparation of low dimensional structures on the top of strain sensitive substrates in a clean room. He/she will be also involved in electro-magneto and opto-resistance measurements.

The internship will be conducted in the department of magnetic objects on the nanoscale at the IPCMS that is providing expertise in materials synthesis and in fabrication of magnetic structures using world class nanofabrication facilities.

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Literature

1. A. Fert, *The origin, development and future of spintronics*, [Noble prize lecture](#) (2007).
2. T. Maruyama, et al., *Nat. Nanotechnol.* **4**, 158 (2009).
3. E. Y. Tsymbal, *Nat. Mater.*, **11**, 12 (2012).
4. P. Li, et al. *Adv. Mater.*, **26**, 4320 (2014).
5. Y. Shirahata, *NPG Asia Materials* (2015).
6. B. Kundys, V. Iurchuk, C. Meny, H. Majjad, B. Doudin, *Appl. Phys. Lett.* **104**, 232905 (2014).
7. V. Iurchuk, B. Doudin, B. Kundys *J. Phys.: Condens. Mater.* **26**, 26292202 (2014).

Further readings:

- 1) (Magnétorésistance géante) https://fr.wikipedia.org/wiki/Magn%C3%A9tor%C3%A9sistance_g%C3%A9ante
- 2) (Magnétorésistance) <https://fr.wikipedia.org/wiki/Magn%C3%A9tor%C3%A9sistance>
- 3) (Pulvérisation cathodique) https://fr.wikipedia.org/wiki/Pulv%C3%A9risation_cathodique